FIG.1

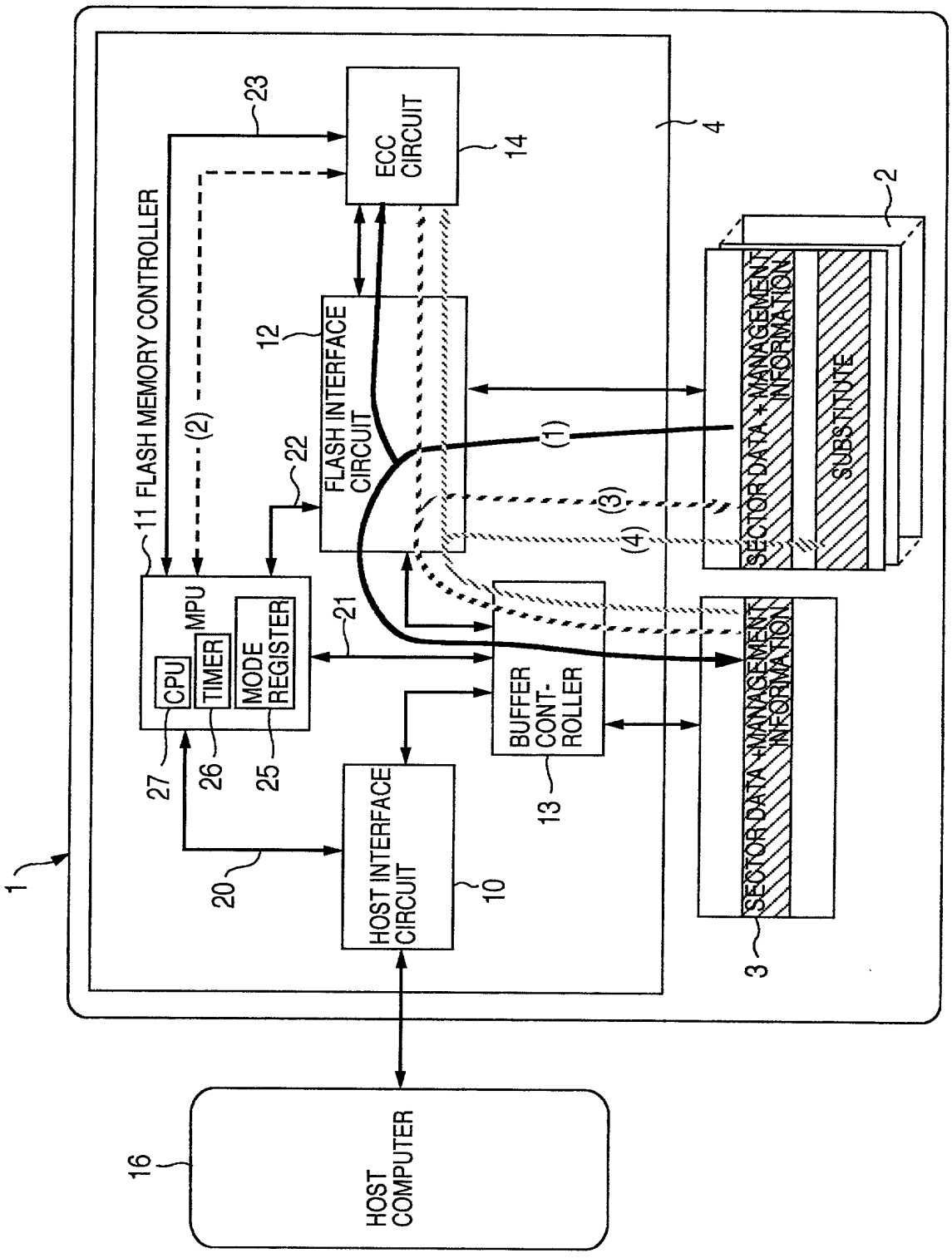

1
4
11 FLASH MEMORY CONTROLLER
MPU
CPU
TIMER
MODE REGISTER
27
26
25
20
HOST INTERFACE CIRCUIT
10
16
HOST COMPUTER
12
FLASH INTERFACE CIRCUIT
22
21
23
ECC CIRCUIT
14
BUFFER CONT-ROLLER
13
(1)
(2)
(3)
(4)
2
SECTOR DATA + MANAGEMENT INFORMATION
SUBSTITUTE
3
SECTOR DATA + MANAGEMENT INFORMATION

FIG.2

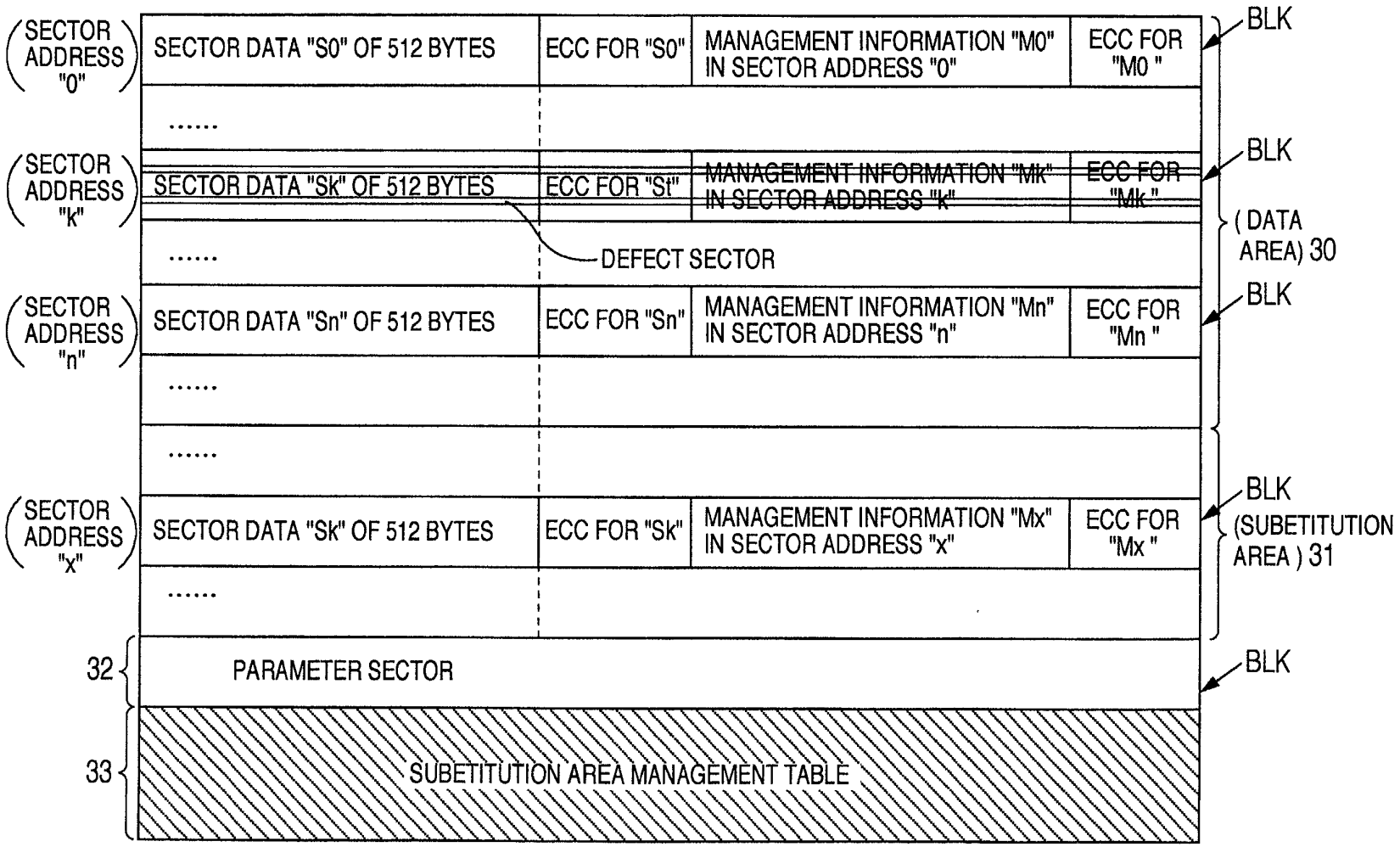

SECTOR ADDRESS "0"
SECTOR DATA "S0" OF 512 BYTES
ECC FOR "S0"
MANAGEMENT INFORMATION "M0" IN SECTOR ADDRESS "0"
ECC FOR "M0 "
BLK
SECTOR ADDRESS "k"
SECTOR DATA "Sk" OF 512 BYTES
ECC FOR "Sk"
MANAGEMENT INFORMATION "Mk" IN SECTOR ADDRESS "k"
ECC FOR "Mk "
BLK
DEFECT SECTOR
(DATA AREA) 30
SECTOR ADDRESS "n"
SECTOR DATA "Sn" OF 512 BYTES
ECC FOR "Sn"
MANAGEMENT INFORMATION "Mn" IN SECTOR ADDRESS "n"
ECC FOR "Mn "
BLK
SECTOR ADDRESS "x"
SECTOR DATA "Sk" OF 512 BYTES
ECC FOR "Sk"
MANAGEMENT INFORMATION "Mx" IN SECTOR ADDRESS "x"
ECC FOR "Mx "
BLK
(SUBETITUTION AREA) 31
32
PARAMETER SECTOR
BLK
33
SUBETITUTION AREA MANAGEMENT TABLE

FIG.3

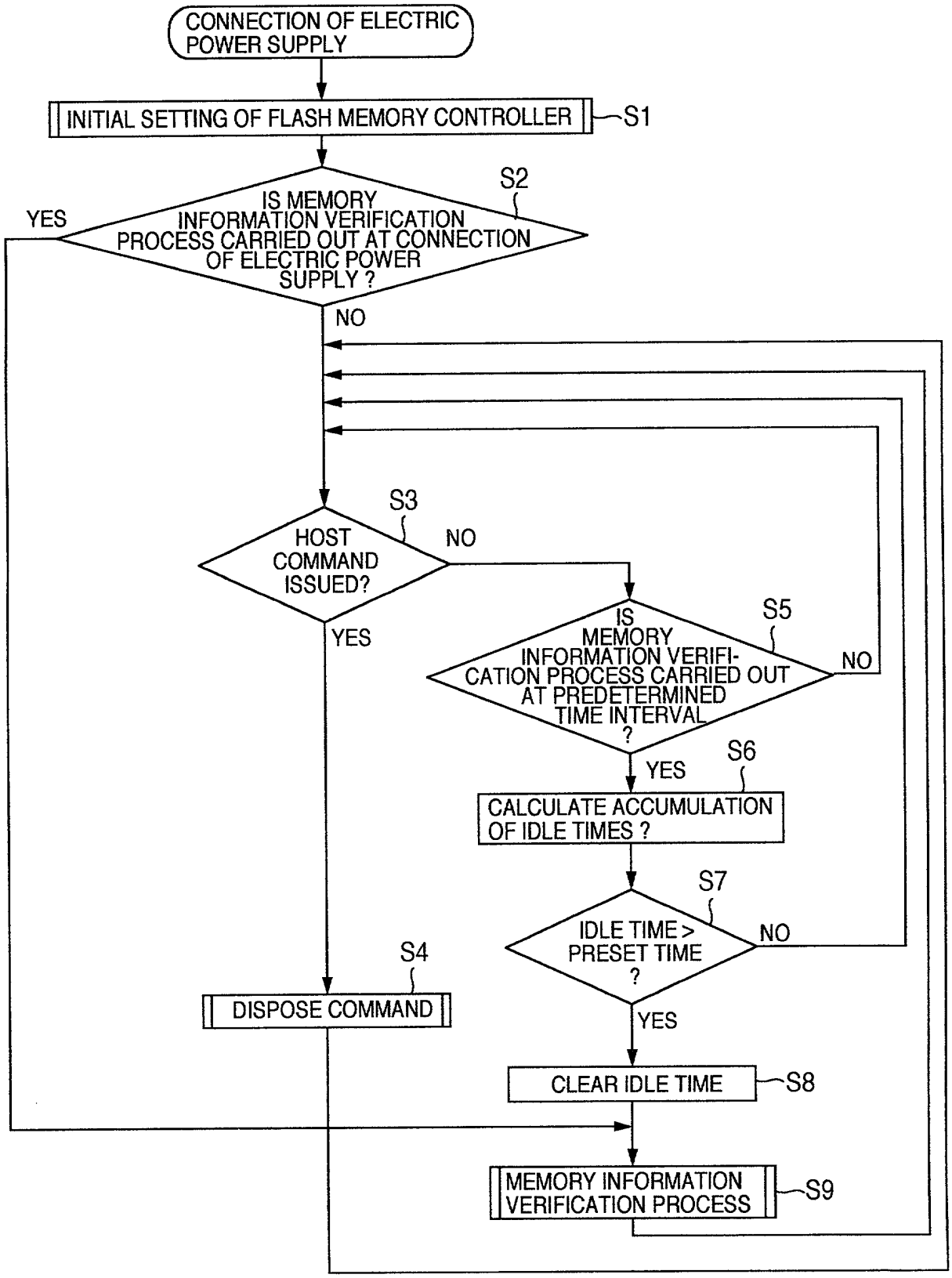

CONNECTION OF ELECTRIC POWER SUPPLY
INITIAL SETTING OF FLASH MEMORY CONTROLLER
S1
S2
IS MEMORY INFORMATION VERIFICATION PROCESS CARRIED OUT AT CONNECTION OF ELECTRIC POWER SUPPLY ?
YES
NO
S3
HOST COMMAND ISSUED?
NO
YES
S5
IS MEMORY INFORMATION VERIFI-CATION PROCESS CARRIED OUT AT PREDETERMINED TIME INTERVAL ?
NO
YES
S6
CALCULATE ACCUMULATION OF IDLE TIMES ?
S7
IDLE TIME > PRESET TIME ?
NO
YES
S4
DISPOSE COMMAND
CLEAR IDLE TIME
S8
MEMORY INFORMATION VERIFICATION PROCESS
S9

FIG.4

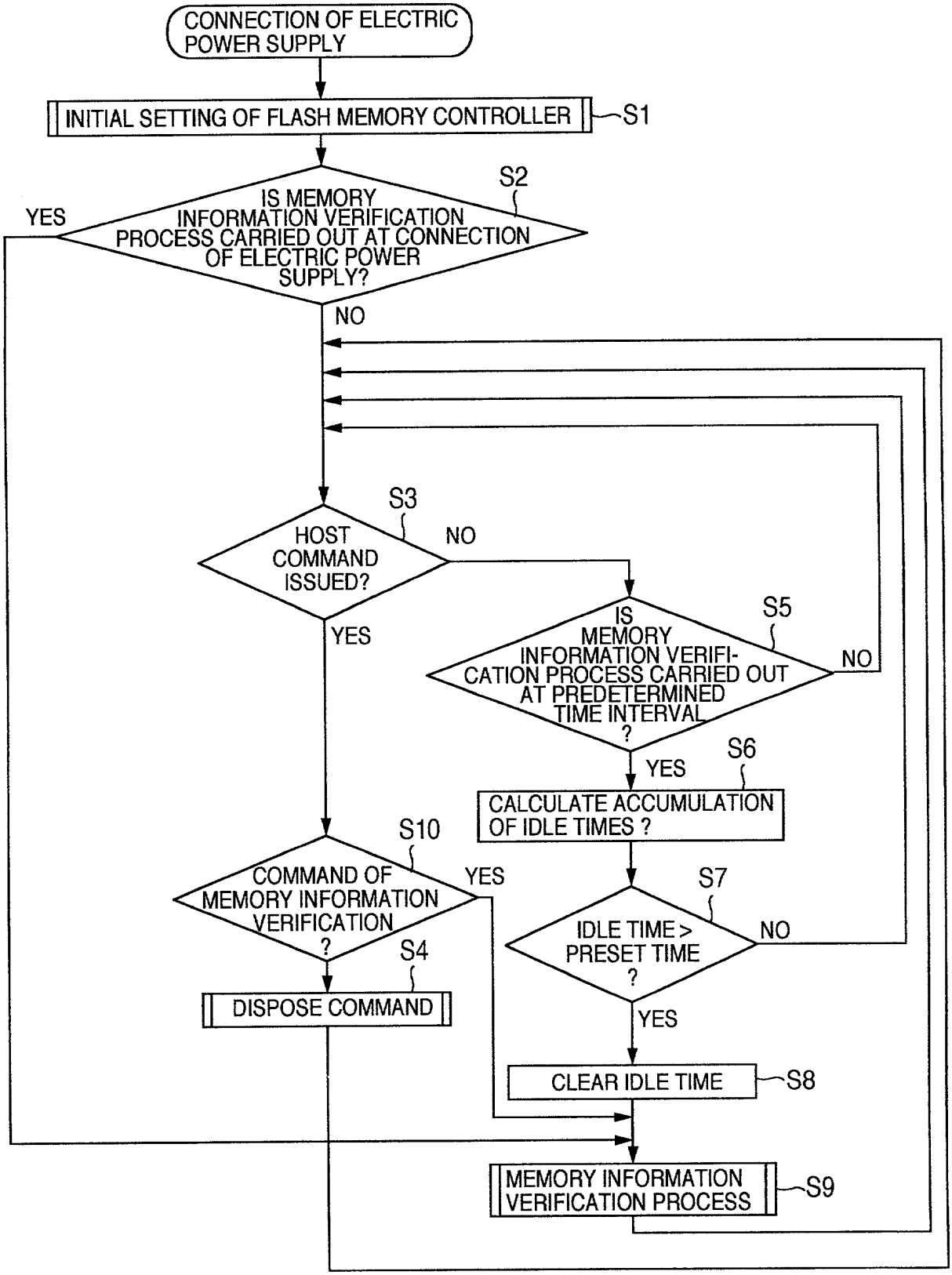

CONNECTION OF ELECTRIC POWER SUPPLY
INITIAL SETTING OF FLASH MEMORY CONTROLLER
S1
S2
IS MEMORY INFORMATION VERIFICATION PROCESS CARRIED OUT AT CONNECTION OF ELECTRIC POWER SUPPLY?
YES
NO
S3
HOST COMMAND ISSUED?
NO
YES
S5
IS MEMORY INFORMATION VERIFI-CATION PROCESS CARRIED OUT AT PREDETERMINED TIME INTERVAL ?
NO
YES
S6
CALCULATE ACCUMULATION OF IDLE TIMES ?
S10
COMMAND OF MEMORY INFORMATION VERIFICATION ?
YES
S7
IDLE TIME > PRESET TIME ?
NO
S4
DISPOSE COMMAND
YES
CLEAR IDLE TIME
S8
MEMORY INFORMATION VERIFICATION PROCESS
S9

FIG.5

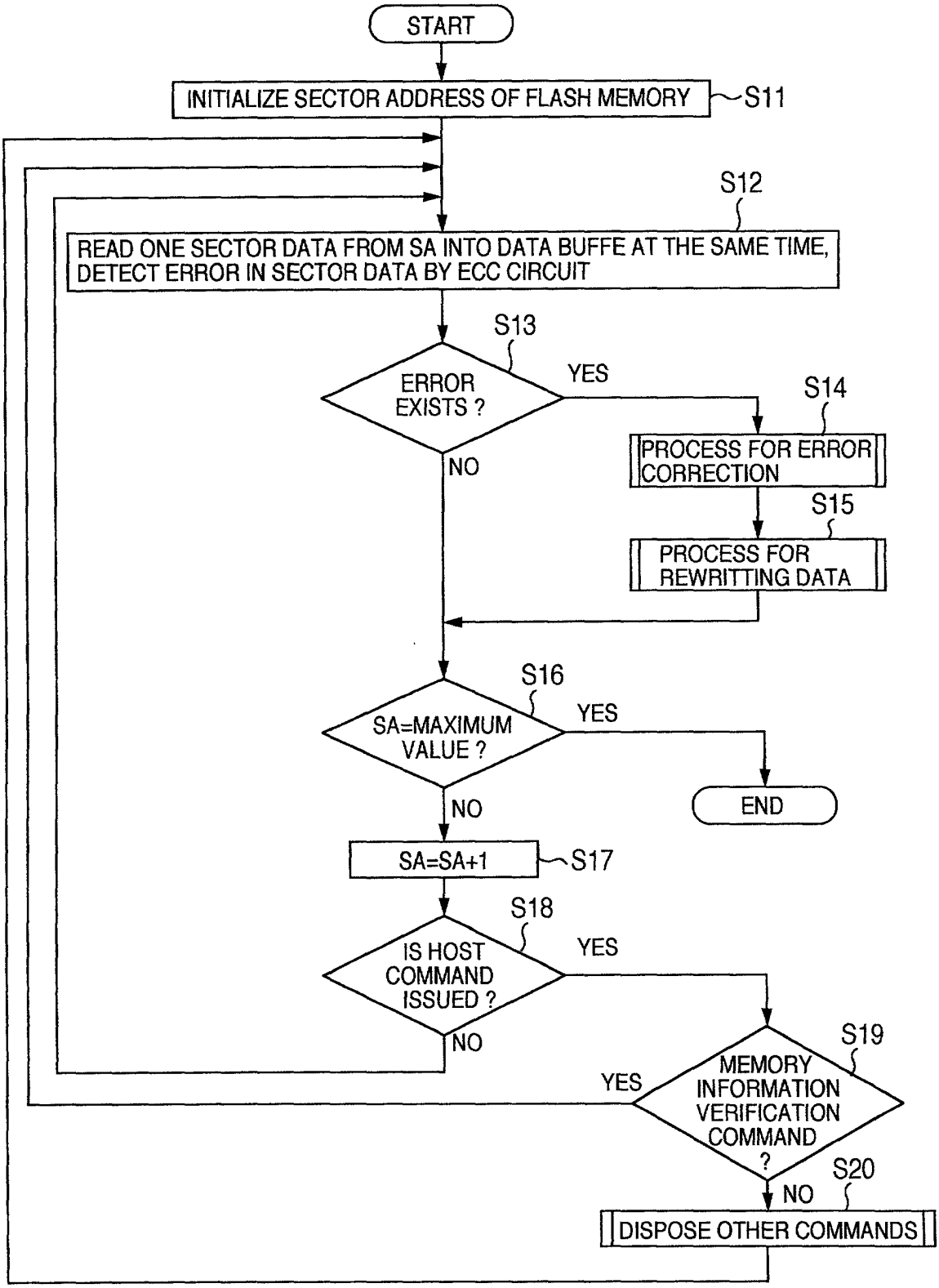

START
INITIALIZE SECTOR ADDRESS OF FLASH MEMORY
S11
S12
READ ONE SECTOR DATA FROM SA INTO DATA BUFFE AT THE SAME TIME, DETECT ERROR IN SECTOR DATA BY ECC CIRCUIT
S13
ERROR EXISTS ?
YES
NO
S14
PROCESS FOR ERROR CORRECTION
S15
PROCESS FOR REWRITTING DATA
S16
SA=MAXIMUM VALUE ?
YES
NO
END
SA=SA+1
S17
S18
IS HOST COMMAND ISSUED ?
YES
NO
S19
MEMORY INFORMATION VERIFICATION COMMAND ?
YES
NO
S20
DISPOSE OTHER COMMANDS

FIG.6

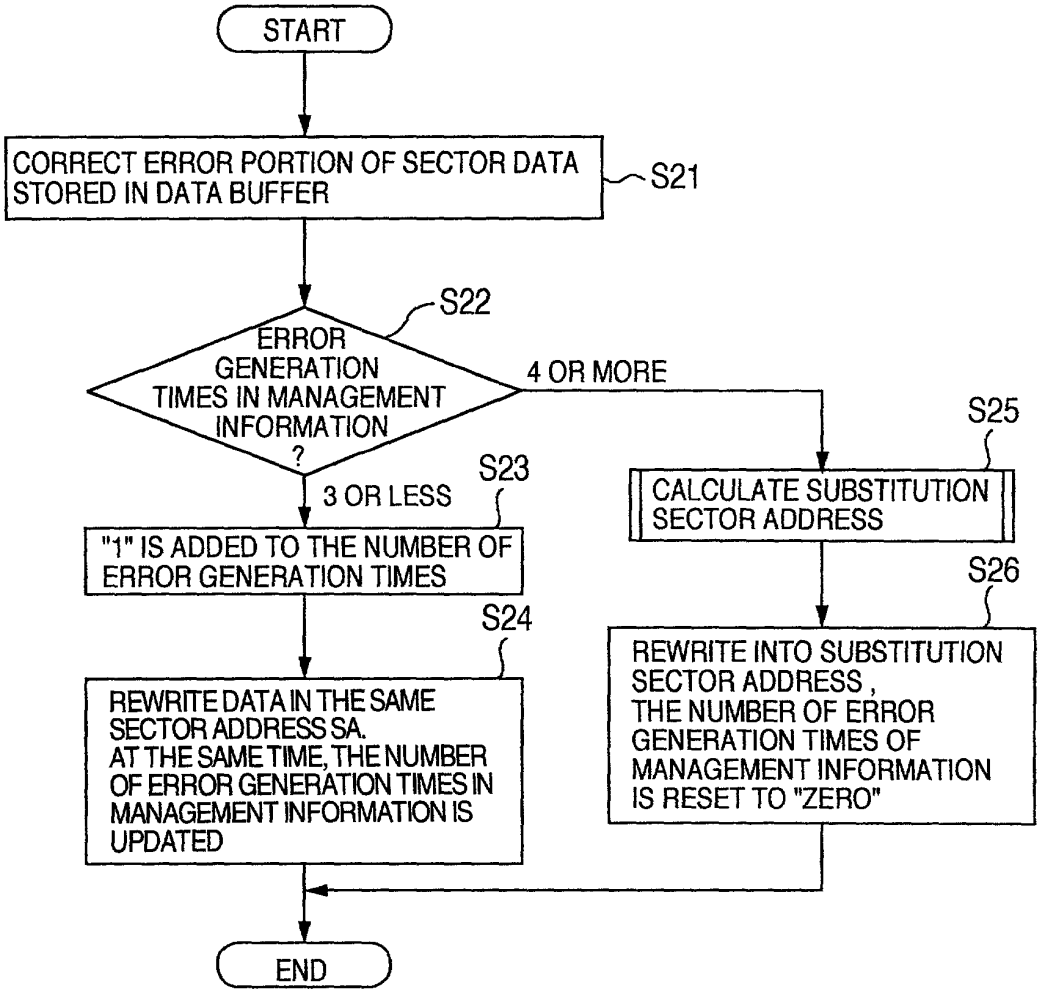

START
CORRECT ERROR PORTION OF SECTOR DATA STORED IN DATA BUFFER
S21
S22
ERROR GENERATION TIMES IN MANAGEMENT INFORMATION ?
4 OR MORE
3 OR LESS
S23
"1" IS ADDED TO THE NUMBER OF ERROR GENERATION TIMES
S24
REWRITE DATA IN THE SAME SECTOR ADDRESS SA. AT THE SAME TIME, THE NUMBER OF ERROR GENERATION TIMES IN MANAGEMENT INFORMATION IS UPDATED
S25
CALCULATE SUBSTITUTION SECTOR ADDRESS
S26
REWRITE INTO SUBSTITUTION SECTOR ADDRESS , THE NUMBER OF ERROR GENERATION TIMES OF MANAGEMENT INFORMATION IS RESET TO "ZERO"
END

FIG.7

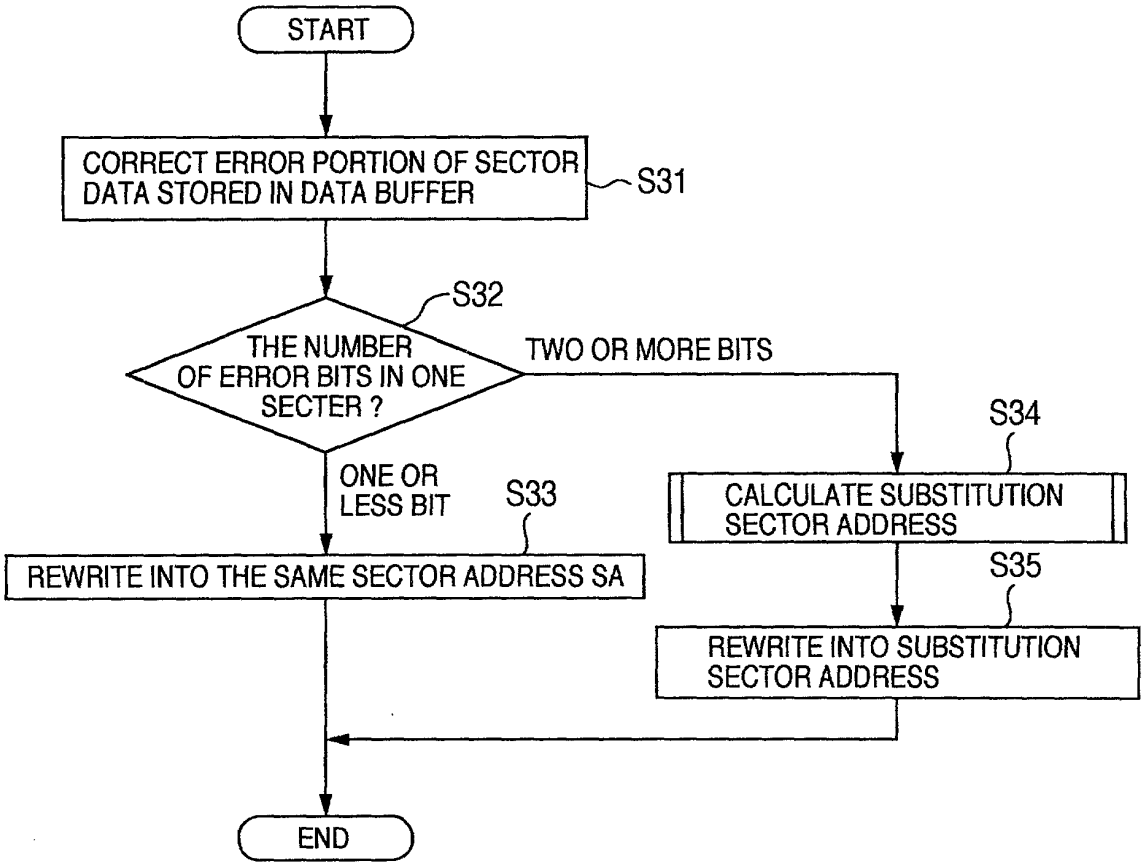

START
CORRECT ERROR PORTION OF SECTOR DATA STORED IN DATA BUFFER
S31
S32
THE NUMBER OF ERROR BITS IN ONE SECTER ?
TWO OR MORE BITS
ONE OR LESS BIT
S33
S34
CALCULATE SUBSTITUTION SECTOR ADDRESS
S35
REWRITE INTO THE SAME SECTOR ADDRESS SA
REWRITE INTO SUBSTITUTION SECTOR ADDRESS
END

FIG.8

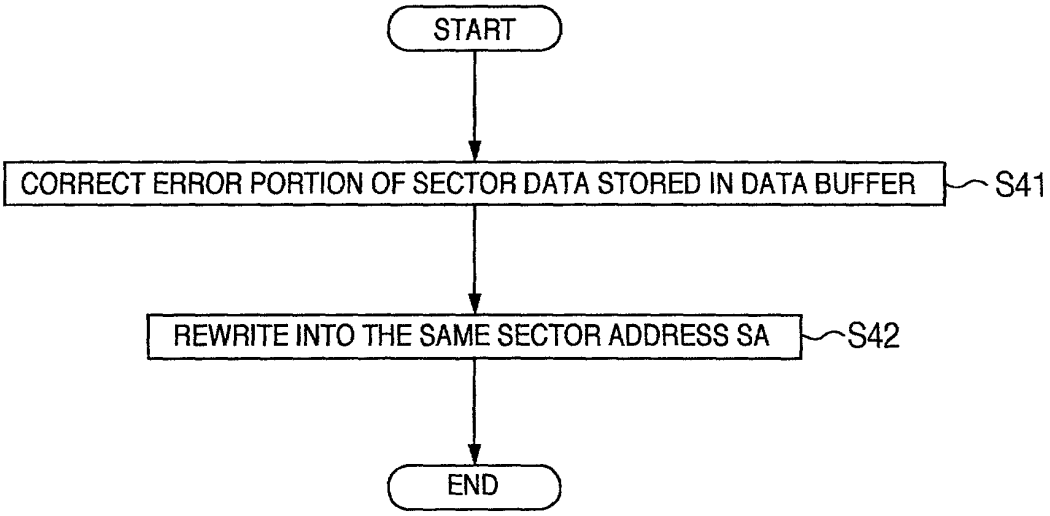

START
CORRECT ERROR PORTION OF SECTOR DATA STORED IN DATA BUFFER
S41
REWRITE INTO THE SAME SECTOR ADDRESS SA
S42
END

FIG.9

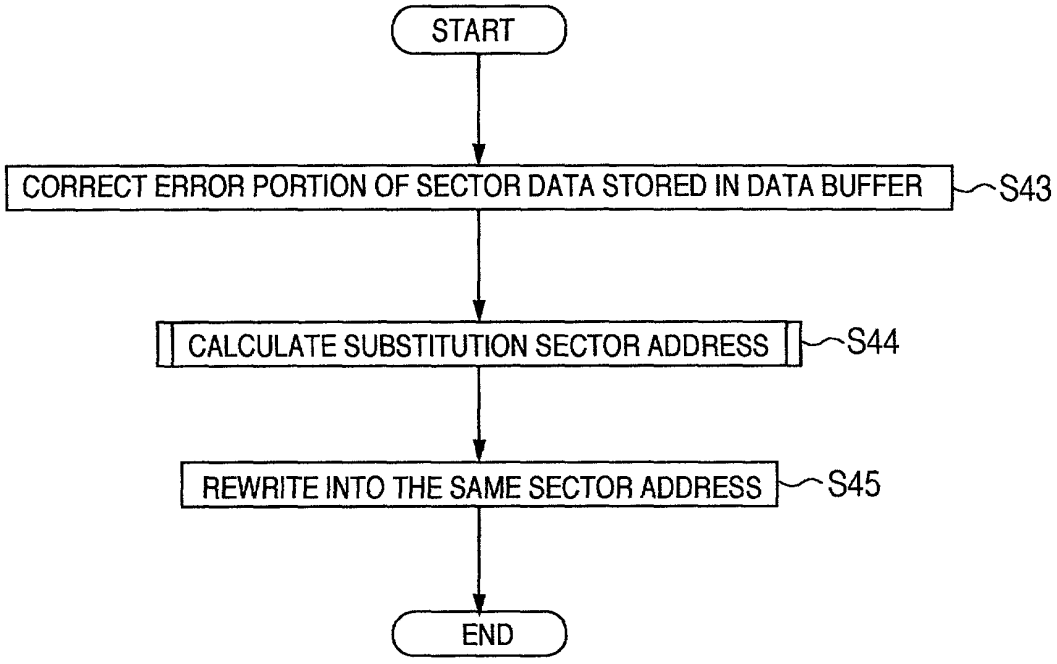
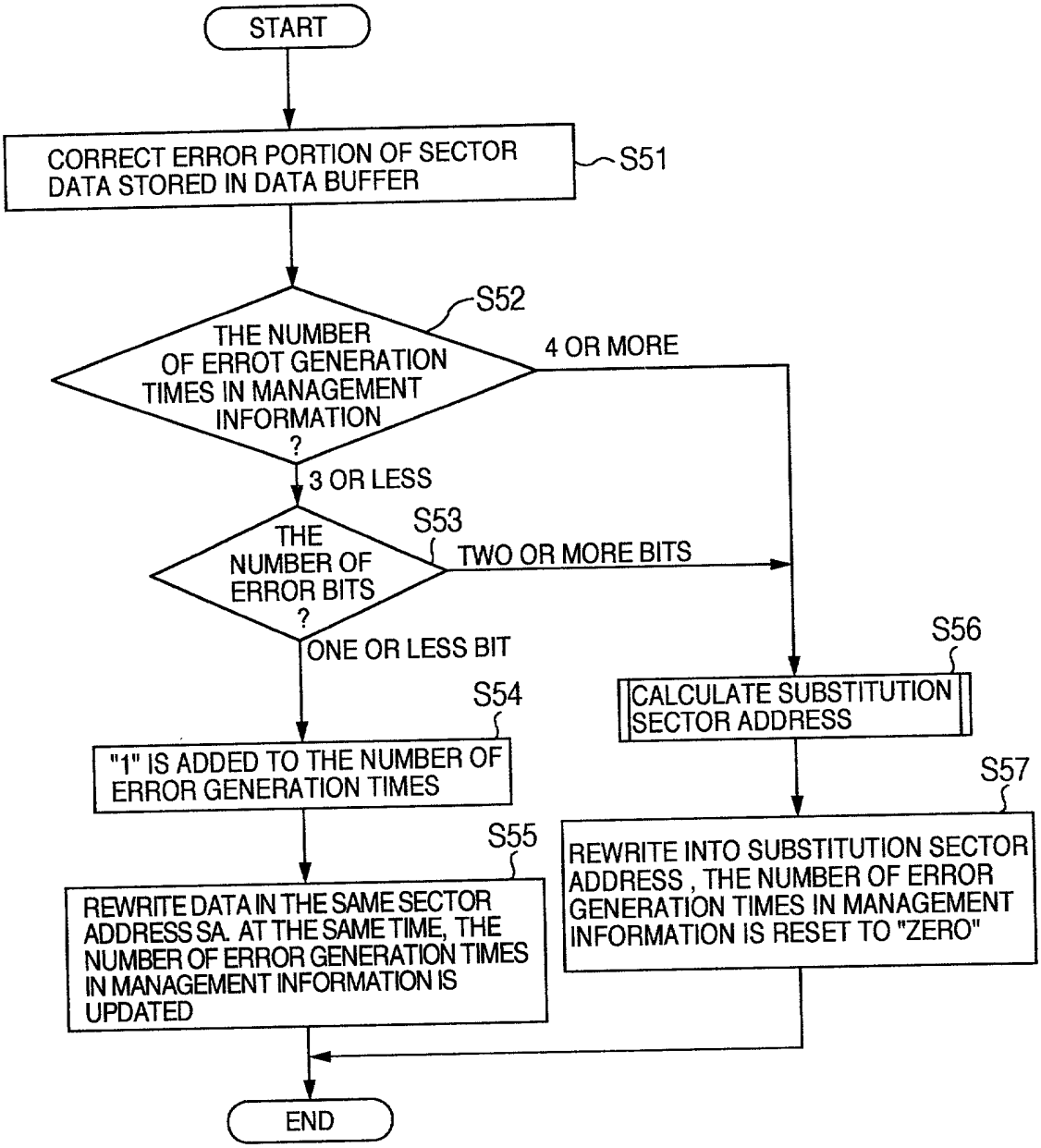

START
CORRECT ERROR PORTION OF SECTOR DATA STORED IN DATA BUFFER
S43
CALCULATE SUBSTITUTION SECTOR ADDRESS
S44
REWRITE INTO THE SAME SECTOR ADDRESS
S45
END

FIG.10


START
CORRECT ERROR PORTION OF SECTOR DATA STORED IN DATA BUFFER
S51
THE NUMBER OF ERROT GENERATION TIMES IN MANAGEMENT INFORMATION ?
S52
4 OR MORE
3 OR LESS
THE NUMBER OF ERROR BITS ?
S53
TWO OR MORE BITS
ONE OR LESS BIT
S54
"1" IS ADDED TO THE NUMBER OF ERROR GENERATION TIMES
S55
REWRITE DATA IN THE SAME SECTOR ADDRESS SA. AT THE SAME TIME, THE NUMBER OF ERROR GENERATION TIMES IN MANAGEMENT INFORMATION IS UPDATED
S56
CALCULATE SUBSTITUTION SECTOR ADDRESS
S57
REWRITE INTO SUBSTITUTION SECTOR ADDRESS , THE NUMBER OF ERROR GENERATION TIMES IN MANAGEMENT INFORMATION IS RESET TO "ZERO"
END